An Identical Parallel Machine Problem with Maintenance Activity

Wen-Chiung Lee
Department of Statistics
Feng Chia University
Taichung, Taiwan

Jen-Ya Wang
Department of Computer Science and Information Management
Hungkuang University
Sha Lu 43302, Taiwan

Abstract

Scheduling with maintenance activities has been extensively studied in the past decades. However, most studies focus on single-machine problems. In reality, there are many machines or assemble lines to process jobs. It is seldom discussed due to its complexity. Moreover, the machines need preventive maintenance activities to avoid breakdown. In this article, we study an identical machine problem in which the machines need to perform a maintenance activity within a specified period of time. The objective is to minimize the total tardiness of all jobs. To the best of our knowledge, this problem has never been studied before. We develop four dominance properties and a lower bound to facilitate the search for the optimal solutions of the branch-and-bound algorithm for problems with small number of jobs. In addition, we propose a genetic algorithm to obtain the approximate solutions. Computational experiments are provided to evaluate the performance of the proposed algorithms. Results show that the branch-and-bound algorithm can solve problems with 12 jobs within a reasonable amount of time, and the genetic algorithm is quite accurate with the mean error of less than 3%.

Keywords
Scheduling; Total weighted completion time; Two-agent; Parallel machine

Biography

Wen-Chiung Lee is a Professor in the Department of Statistics in Feng-Chia University. He received his Ph.D. (1993) from the Department of Statistics in Florida State University. His current research interests include scheduling and applied statistics. He has published a number of papers in international journals such as *European Journal of Operational Research, International Journal of Production Economics, Computers and Operations Research, Applied Mathematical Modeling, Information Sciences, Applied Mathematics and Computation, Computers & Industrial Engineering, Applied Soft Computing, Computers and Mathematics with Applications, Omega, The International Journal of Management Science, Journal of the Operational Research Society, and Information Processing Letters.*

Jen-Ya Wang is an associate professor in the Department of Computer Science and Information Management in Hungkuang University. He received his PhD degree (2009) in Department of Computer Science and Engineering at National Chung-Hsing University. His current research interests include database system, patent search, and scheduling. He has published a number of papers in international journals such as *Computers and Operations Research, Information Sciences, International Journal of Innovative Computing, Information and Control, Expert System with Applications, Concurrent Engineering: Research and Applications, International Journal of Software Engineering and Knowledge Engineering, African Journal of Business Management, Applied Mathematics and Computation, and IEEE Magazines on Engineering in Medicine and Biology.*